

Diseases of Sweet Potatoes

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Grown by W. H. Longacre, between Mullica Hill and Swedesboro. Seven baskets to 100 hills. No manure used. High-grade fertilizer, 700 lbs. to the acre.

Courtesy of New Jersey State Department of Agriculture, Trenton.

NEW JERSEY
AGRICULTURAL EXPERIMENT STATIONS

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NEW JERSEY
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DISEASES OF SWEET POTATOES¹

For many years a large percentage of the sweet potatoes consumed on the eastern and western markets have been produced in the southern counties of New Jersey. The crop for 1920 has been estimated at 2,002,000 bushels, averaging 143 bushels to the acre, but as high as 400 bushels have been produced on some of the more productive soils. The soil, season, and market are exceptionally favorable for the further development of the industry in this state.

A long and continued cropping of sweet potatoes on soils especially adapted to their production without crop rotation and without much attention to sanitary measures to prevent disease dissemination, has resulted in "disease sick soils", that is, soils containing great numbers of sweet-potato disease-producing organisms. It is generally believed that sweet-potato diseases have become more destructive during the past few years, resulting in larger losses than in former years. There is every reason to believe that these conditions will not improve unless methods are devised for the reduction and control of the most important diseases.

There are four very important sweet-potato field diseases in the state which have been more or less well known to New Jersey growers for many years, but have not received as much attention as they have deserved. The storage problems which are closely associated with the field diseases also present a very important field for study. The losses caused by field diseases and storage rots will easily exceed 50 per cent of the crop before it reaches the consumer. The amount of loss each year depends largely upon the seriousness of "stem wilt", "black rot", "soil rot", "scurf" and "soft rot" in a field throughout the growing season.

The late Dr. B. D. Halsted of this station, Dr. L. L. Harter of the United States Bureau of Plant Industry, and Dr. J. J. Taubenhau of the Delaware station and later of the Texas station, have done considerable work on field diseases of the sweet potato, but there are a great many disease problems in this state which must be solved according to local conditions. During the past year the

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writers have made a special study of sweet-potato diseases as they exist under New Jersey conditions. Valuable advice has been given by Dr. J. G. Lipman, director of the Experiment Station, and the writers have had the very able assistance of the county agents and many successful growers who have taken an active interest in the work. It is hoped that the experimental work which we are carrying on will be of value to the growers in reducing and controlling these diseases.

Yellow Stem, Stem Wilt or Stem Rot

Fusarium batatis and *Fusarium hyperoxysporum* (Wr.)

Extent of Injury

This is one of the most destructive field diseases of sweet potatoes in New Jersey. Dr. Halsted observed it in this state in 1890, Dr. Taubenhaus has found it the cause of heavy losses on some fields in Delaware, and Dr. Harter has since reported it in nearly all the states where sweet potatoes are extensively grown.

The average loss due to stem wilt alone in New Jersey has been estimated at 23 per cent, a net loss of 460,460 bushels of potatoes, which would exceed a loss of \$500,000 at digging time. The average loss in Gloucester County has been estimated at 25 per cent of the total crop. A. W. Pearson, a New Jersey sweet-potato grower, in 1904 observed as much as 75 per cent loss of sweet potatoes due to the stem wilt. He lost a large number of plants, which were set from the first three pullings from the hot-bed, while the fourth pulling showed no loss. He discovered that half of the potatoes in the hot-bed had rotted before the fourth pulling was made and that the other half had produced good sprouts, and he wrote, "I suspect the rotted tubers are those infected with stem rot, and that this explains why those plants which were set from the fourth pulling remain healthy; they being taken from the uninfected tubers resting in the bed after those diseased with stem rot had ceased sprouting."

The stem wilt disease has been reported as serious on New Jersey crops where sweet potatoes had not been grown for 15 years or longer. In 1920 the junior author examined a field in New Jersey which had not been cropped with sweet potatoes for 12 years on which there was 65 per cent infection of stem wilt. Dr. Harter noted stem-wilt infection on soils which had not been cropped in sweet potatoes for 40 years near Vineland, New Jersey. It is impossible to say whether the organism persisted in the field or was carried on the sprouts from the hot-beds. The wilt fungus is carried over winter in the potatoes in storage and in the infected soils. Sprouts from infected roots usually become infected in the seed-bed and healthy sprouts may become infected in the field. The heaviest losses usually occur on sandy soils.



Fig. 1.

Fig 1. Discoloration in the Potato due to Stem Wilt



Fig. 2.



Fig. 3.

Fig. 2. A Cross-Section of a Sweet Potato showing the Disease in the Tissues

Fig. 3. A Stem-Wilt Diseased Vine at the left; a Healthy Vine at the Right

Nature of the Disease

At various times from a few days to several weeks after the diseased plants are set in the field, the leaves turn yellow, the plant wilts and dies. This depends largely on the time and severity of the infection. Later the diseased plants turn black and shed their leaves. If the stem of a diseased plant is split near the base when it begins to turn yellow, a dark layer will be seen on the inside (fig. 3). This darkening due to disease also may be found in the root of the potato (fig. 1).



Fig. 4. Examining *Fusarium*-Wilted Sweet-Potato Vines; Note Misses Caused by the Disease

In wet seasons, wilting is less severe than during dry seasons, since enough water may reach the leaves to keep up a green color and growth for some time. When the season becomes dry, less water reaches the leaves, and wilting is much more noticeable. Some growers consider the wilt as being due to weather conditions, and the amount of water does have an indirect relation to wilting when plants or soils are infected. Diseased potatoes dry out more rapidly than healthy potatoes in storage. If the disease is not severe enough to kill the plant, it frequently stimulates the production of a large number of small even-sized potatoes.

Sometimes when the vine dies late in the season the potatoes which by this time may have been large will sprout in the soil, sending out an abundance of new growth. This growth is killed by frost or the disease. Plants which die about harvest time may

not have been infected when taken from the hot-bed, but may have become diseased from the infected soil.

Stem wilt, also known as stem rot, is caused by either of two fungi: *Fusarium batatatis* or *Fusarium hyperoxysporum*. The fungus filaments branch very extensively and this growth becomes so abundant in the water-conducting vessels in the vines that it clogs them, hindering the passage of water from the roots to the leaves. It produces many spores that are easily disseminated through the soil and from field to field.

Nearly all of the sweet-potato soils in the state are infected with the stem-wilt organism to some extent, some fields being more heavily infected than others.

How to Control It

Seed potatoes should be selected at digging time when the disease can be readily detected. This can be done by splitting the stems at the point of attachment to the roots and examining them carefully. Plants that show discoloration should be thrown out. The most careful work will not eliminate all the diseased plants, because the discoloration may be very slight in slightly diseased plants. The selected seed should be stored carefully and separate from all other potatoes, and should be treated and bedded in accordance with the instructions on page 19.

This method has been practiced for three years by growers in Atlantic County and for one year in Gloucester County with very encouraging results.

A great many sweet-potato varieties of commercial value should be tried out on infected soils, in order to determine those which are most resistant to disease in this state. Dr. Harter has noted resistant varieties in South Carolina, but most varieties found to be disease-resistant in some states have proven to be susceptible in other states. The southern varieties have not as yet become of much commercial value in the eastern markets as compared with the smaller-root varieties grown in this state.

Plants transported from some distance lose water, and when set in the field the growth is generally slow. A large amount of infection has been observed where growth was slow in starting. Sprouts should be set in the field soon after they are pulled from the hot-bed while the root system is still full of water. If there is not sufficient water in the soil at setting time, a good supply should be added in the hill, as plenty of water will stimulate early growth. If this is done a great many plants will live and grow, which would die under dry conditions. While crop rotation will not control the disease, under some conditions it will reduce it, and many of our good growers are at present practicing rotation when it is possible. Methods of selecting, storing and bedding sweet potatoes are described on pages 18-22.

Black Rot

Sphaeronema fimbriatum (E. & H.) Sacc.

Nature of Disease and Extent of Loss

Black rot is one of the most common diseases of the sweet potato in New Jersey. It causes heavy losses both in field and in storage, and sometimes is found to cause serious loss in the hot-bed. Some growers have abandoned the growing of sweet potatoes for other crops on some soils because of this rot.



Fig. 5. A Healthy Sprout at the Left; Two Plants Diseased with Black Rot at the Right, Showing Black Shank at Base

At digging time black rot occurs on the potato as a characteristic circular, moist, smooth, dark or dark brown spot (fig. 6). In storage the rot on the roots may be irregular in shape, and it develops more rapidly than in the field. It may cause the loss of the entire root, leaving a hard dry potato. If infected with other organisms a soft rot may develop. A potato diseased with the black rot usually has a very bitter taste when raw or after it is cooked. Sometimes the rot advances so rapidly in the hot-bed that every sprout on a diseased potato will show the black shank symptom of the disease. Sprouts set from diseased potatoes usually turn yellow, wilt and die in the field at various periods after they are set, dependent on the severity of the infection.

Black rot is caused by a fungus *Sphaeronema fimbriatum*

(E. & H.) Sacc. There are four or more spore stages of this fungus, all of which germinate and cause infection on the potato, and all of which may be present at one time on the potato under certain conditions. Many of these spores remain in the soil and infect future crops. High temperature and abundant moisture favor the development of the fungus on the potato.

Measures of Control

At the beginning of the digging period it is advisable to dig a row or two of sweet potatoes at various intervals in fields where



Fig. 6. Black Rot on Sweet Potatoes

the disease has previously been found. In this way an outbreak of the disease can be detected and a considerable saving of the potatoes effected by early digging where infection occurs, thereby reducing a loss that might have occurred had the crop been allowed to remain in the soil 2 to 4 weeks longer.

Selecting and treating seed, setting healthy plants (pages 18-22) and crop rotation will tend to reduce this disease very materially. Manures furnish a good medium for the growth of the disease-producing organism, especially on land that is already heavily infected. When sufficient organic matter is already in a soil to support good growth, high-grade fertilizers should replace the use of organic manures.

At digging time and before bedding, all potatoes showing bruises and signs of disease should be thrown out. Potatoes selected for seed should be soaked in a corrosive sublimate solution (page

19) and bedded in clean sand beds (page 19). It is not advisable to plant potatoes on soils infected with this fungus for at least three or four years.

The loss in storage due to black rot is much higher when the potatoes are stored in bins, hence hampers and barrels should be more generally used. When the sprouts are pulled from the hot-bed for planting care should be taken to throw out all that are diseased. A sprout diseased with black rot will generally die after it is planted.



Fig. 7. Sweet Potatoes first Diseased with Soil Rot; Black Rot Later Developed in the Soil-Rot Injury

Soil Rot, "Pit", or "Pox"

Cystospora batatis Elliot

Description

This disease is very widely distributed in New Jersey sweet-potato soils but is not as destructive as some other diseases. It appears to be most severe on soils that are alkaline or only slightly acid. It is of little or no importance in storage or hot-bed, but is primarily a field disease. Dr. Taubenhause has reported it on turnips, beets, white potatoes and possibly tomatoes.

The most characteristic symptom is the low yield of potatoes on diseased soils. Sometimes the vines may be large and richly colored, yet have only a small root system. If a diseased hill is removed without breaking the roots a great many dark areas will

be seen on the roots, frequently girdling them. The healthy parts of diseased roots frequently produce large potatoes. The irregular growth of diseased roots results in deformed potatoes (fig. 8).

Sometimes the organism attacks large potatoes near the end of the growing season, causing round shallow injuries which are not so pronounced as the injuries on roots that are attacked when young. The decay at first is usually smooth, and later on the infected part peels out, especially after the potato is placed in dry storage. The yield of potatoes on soils infected with the pox organism is usually greatly reduced; at digging time large, apparently healthy plants may not have more than a few if any healthy potatoes on them, and these few are usually very large. Black rot often follows the injury caused by the soil rot organism (fig. 7).



Fig. 8. Different Stages of Infection; the Potato at the Right was Attacked as a Small Root; the Infected Part Ceased Growing, while the other Part Continued to Grow

Soil rot is caused by a slime mold fungus *Cystospora batatis*. The organism is thought to pass its entire life cycle in the soil, attacking the sweet potato, white potato, turnip and beet under favorable soil conditions, causing the shallow rots. The fungus probably remains dormant in the soil over winter. The disease is usually most destructive on soils which are alkaline or slightly acid and appears to be of little importance on soils that are decidedly acid.

Sulfur as a Means of Control

Dr. Halsted was one of the first workers on plant disease prevention to apply various antiseptic compounds to the soils. In 1898, he showed very conclusively that sulfur broadcasted at the rate of 300 pounds to the acre decidedly decreased soil rot. Table 1 gives the results of some of his work, showing the average yields calculated to the nearest unit for the different treatments.

TABLE 1.
Effect of Sulfur on Soil Rot of Sweet Potatoes

Treatment	Clean Roots	Diseased Roots	Total Roots
Experiment 1:			
Sulfur, 50 lbs. per acre.....	25	81	106
Check, no treatment.....	4	110	114
Sulfur, 100 lbs. per acre.....	23	90	113
Check	5	85	90
Sulfur, 200 lbs. per acre.....	20	70	90
Check	6	57	63
Sulfur, 400 lbs. per acre.....	34	16	50
Experiment 2*:			
Sulfur and Kainit, broadcast..	97	27	124
Sulfur and Kainit, in row.....	70	42	112
Kainit over Sulfur, in row.....	44	52	96
Sulfur over Kainit, in row.....	32	52	84
Check	5	29	34
Experiment 3:			
Sulfur with lime in 1895.....	14	43	57
Sulfur alone in 1895.....	50	42	92
Sulfur with Kainit in 1897.....	24	50	74
Sulfur with Kainit in 1899.....	61	43	104
Check	5	29	34

*In this experiment 400 pounds of sulfur and 400 pounds of Kainit were applied.

Dr. Halsted summarizes the results as follows: "The experiments for the past four years show clearly that the soil rot may be held in check by sulfur, and that the fungicide retains its power for a long time in the soil. It is also seen that kainit has a beneficial action, and with sulfur good crops of comparatively clean roots may be produced on land thoroughly filled with the germs of the soil rot."

According to Dr. Halsted's experiments sulfur not only controls the soil rot, but also is responsible for other desirable qualities (fig. 10). Dr. Halsted wrote: "From the sulfured ground the roots were nearly smooth and more uniform in size than elsewhere, the color being of a rich yellow. A rough sort of a potato was assumed by the potatoes in the limed plots."

Sprouts grown from potatoes affected with the soil rot do not necessarily become diseased when set in clean soils. However, diseased potatoes should not be used, since they are likely to rot in the hot-bed. Lime should not be applied in infected soils, as it brings

about favorable soil reactions for the development of the organism in the soil. Small applications of sulfur might be applied to alfalfa and clover sods before planting potatoes on them, and also soils on which had been given large applications of lime. Inoculated sulfur which is now being used for the control of the scab of the white potato may give better results than ordinary sulfur. This is a subject on which we are now working.

The preceding tentative recommendations are based on Dr. Halsted's work. We have not conducted any investigations on the use of sulfur, but have included this problem in our plans for future experiments.



Fig. 9. Sweet Potatoes Attacked by Soil Rot after They Were Mature

Scurf, Soil Stain, or Rust

Monilochaetes infuscans (E. & H.)

Extent of the Disease

It is estimated that during the past year more than 50 per cent of the sweet potatoes harvested in New Jersey were diseased with soil stain, which was prevalent on all heavy soils, and especially on soils where large quantities of manures were used. Scurf was much worse where stable manure was applied in the hill. When the entire potato is blackened with the scurf fungus, it is liable to dry out in storage more readily than a healthy potato. The market value of scurf-infected potatoes is sometimes reduced. While the

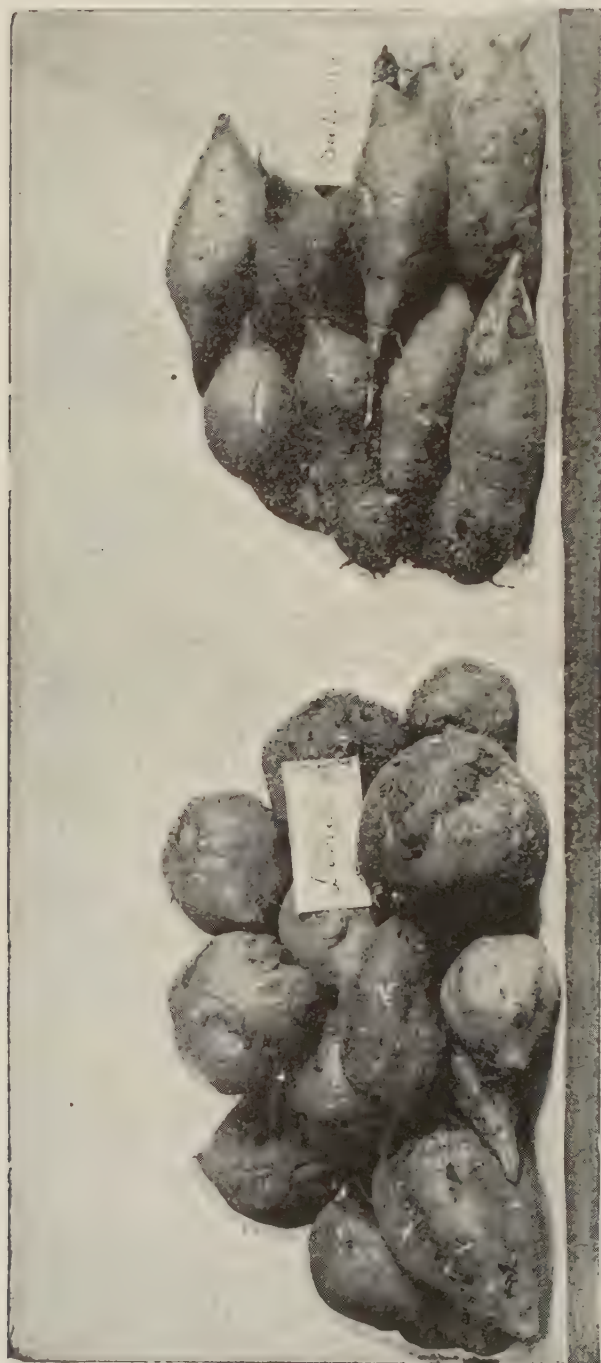


Fig. 10. Sweet Potatoes from Plots Treated with Lime and with Sulfur
(From Special Bulletin S. N. J. Agr. Exp. Sta.)

loss from this disease is indirect, it is of considerable economic importance. It is found on all varieties of the sweet potato grown in the state.

What It Is Like

Scurf occurs as small, circular, moist, brownish spots (fig. 11) on all underground parts of the potato. It occurs only on the surface of the parts affected, and in most cases it spreads rapidly over the entire potato, producing a uniformly brownish clay-colored rind. Red-skinned varieties become blackened when severely attacked but the color is more pronounced on the white or yellow-skinned varieties. The parts of the plants above ground never



Fig. 11. Sweet Potatoes Diseased with the "Scurf" Fungus

show signs of being diseased, but all parts under the ground are subject to attack. Girdling and cracking are sometimes very prominent on sweet potatoes affected with scurf (fig. 12), and these conditions are probably associated with the disease. A few potatoes of a large hill may escape attack, but in most cases the entire hill will be spotted.

Soil stain is caused by a fungus, *Monilochaetes infuscans* E. & H., which can be scraped from the skin and studied under the microscope. A great many spores are produced in chains on the ends of fungus hyphae² which extend into the soil from the potato skin. Moisture dissolves the substance which holds the spores together and they are left in the soil, where they germinate and reinfest sweet potatoes in the following years.

How to Control It

Potatoes affected with soil stain should not be used for growing sprouts without treatment. When clean seed is not obtainable, scurf can be controlled by soaking the potatoes in corrosive sub-



Fig. 12. Cracking of Sweet Potatoes, in Some Cases Probably due to Attack by the Scurf Organism under Excessive Moisture Conditions

limate as described on page 19, provided sprouts from the treated potatoes are grown on soils that do not have an excess of organic manures or on heavy soils.

If organic manures are to be used on sweet-potato soils, they should be broadcasted on the soil at least 8 months preceding the time for setting. Sea-weeds, stable manures, tobacco stems and organic matter from woodland stimulate scurf, and these should never be applied in the row or in the hill. A few years' rest for soils heavily infected will allow the manures to decompose and much of the stain will be prevented.

²Small plant-like fungous growths.

Soft Rot, or Ring Rot

Rhizopus nigricans (Ehr.)

Description

Soft or ring rot is the most destructive storage disease of the sweet potato, having caused as high as 50 per cent loss. While it is considered a storage disease, a very heavy loss sometimes occurs in the hot-bed, and minor losses have been observed in the field when digging is delayed until late in the season.

The disease is first noticed by the rapid softening of the potato. Sometimes a diseased sweet potato appears to be perfectly normal, showing no signs of the disease externally, and will be soft and

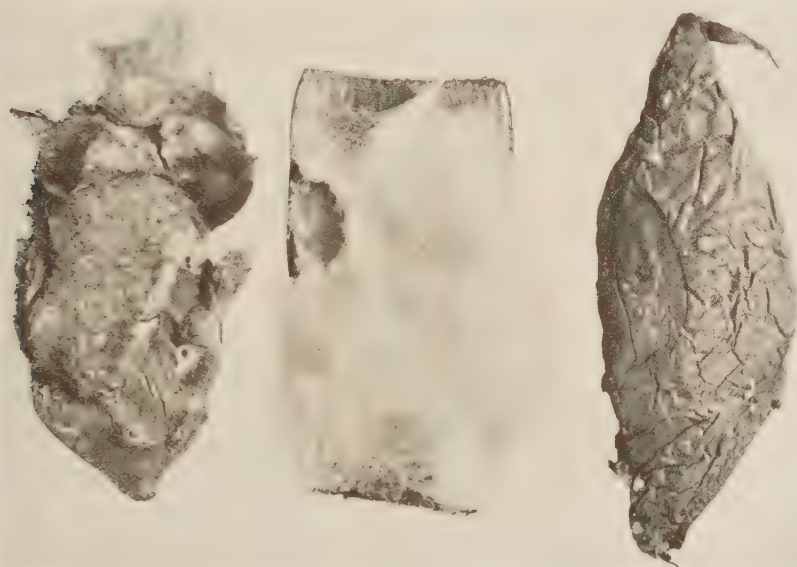


Fig. 13. Soft Rot, showing mass of fungous growth. The potato at the right is also soft and rotten, but the growth of the fungus has not as yet appeared on the outer surface.

decayed internally. If a softened potato is broken open, a straw-colored liquid will flow from the tissues. This liquid has a rather agreeable odor and the taste is not disagreeable. Sometimes a soft ring occurs in the middle or at the end of a potato known as a "ring rot."

These two forms of rot are caused by the same fungus, *Rhizopus nigricans*, which is the organism that causes bread to mold in a warm moist atmosphere. A large cottony mass of fungus threao sometimes develops on the potato, which gradually turns black with the formation of a great many spore heads. These break open in the presence of sufficient moisture, scattering the spores. The

spores germinate under favorable conditions of moisture and temperature, giving rise to a new infection when they come in contact with bruised potatoes, fruits, vegetables, breads or other starchy products.

Control

Before storing the potatoes in the fall, the bins and other sections of the storage house should be disinfected with a formaldehyde solution (3 pints to 50 gallons of water) or with a copper sulfate solution (2 pounds of copper sulfate to 50 gallons of water). Advantage should be taken of the driest part of the fall to dig as many potatoes as possible. Soft rot is usually most severe in storage following a wet digging season.

Store the potatoes with care. Bruised potatoes should be sorted out from the others and sold at digging time. The proper care of the storage house is very essential. Slight chilling will injure the potatoes and make it easy for rot organisms to enter and cause rapid decay.

Leaf Spots

White rust *Albugo ipomoeae panduranae* (Schw.) Swing., and leaf spots, *Phyllosticta batatatis* and *Septoria bataticola*, are very common foliage diseases occurring in New Jersey. Losses due to these diseases are of little economical importance.

Slime Mold

Fuligo violaceae (Pres.). Sometimes a cottony white or yellowish, slimy, jelly growth occurs on plants in the hot-bed, but it rarely causes much damage. The appearance of this organism depends very largely on the seasonal conditions.

Storage Rot

The soft rot and black rot previously referred to are the most important of the storage rots. Other storage rots are the Trichoderma rot (*Trichoderma Koningi*) which is very similar to the soft rot; the dry rot (*Diaporthe batatatis*) which starts at the end of the potato and causes a dry firm, black rot. *Sclerotia bataticola* is a dry black rot of comparatively little importance. The control of these diseases depends largely on the condition of the potatoes at the time of storage and the management of the storage house.

Seed Selection

Since it is well known that stem rot, black rot and scurf are carried in the seed potatoes as well as in the soil, it is evident that the selection of seed relatively free from disease will prove advantageous. The best seed potatoes are usually grown on light sandy loam soil. The seed should be selected before frost and during periods of dry weather if possible. Most growers prefer to plow

out about eight rows and then collect the plants in piles of about 100 each. The first step is the selection of high-yielding plants with well shaped potatoes. Second, throw out all plants showing indications of scurf and black rot. Third, split the vines at the point of union with the potatoes and throw out all that show internal discolorations. It is impossible to make this work 100 per cent perfect, since slightly diseased potatoes will pass the keenest inspection.

Storage

When possible to do so it is advisable to soak the bin with formaldehyde (3 pints in 50 gallons of water) or with copper sulfate (2 pounds in 50 gallons of water) and allow to dry thoroughly before the potatoes are stored. The potatoes should be packed in hampers or barrels so as to permit free circulation of air and to keep them separate from the table stock.

The temperature of the storage house should be kept from 80° to 85° for 10 days to 2 weeks after the potatoes are first stored and should be maintained at 50° to 55° for the remainder of the storage season. It is sometimes necessary to increase the temperature of the house on wet and cold days to prevent chilling. After taking the potatoes from the storage house it is advisable to keep them in a warm room until they are bedded.

Treatment of Seed

Sort and throw out all diseased potatoes, as soon as they are taken from the storage house. Treat the selected seed by dipping in a bichloride of mercury solution (also known as corrosive sublimate). It is very easy to dip the potatoes while they are in the bushel hampers. The solution is prepared by dissolving 1 ounce of bichloride of mercury in 8 gallons of water in a wooden barrel. After dipping the seed potatoes for 10 minutes, spread them out to dry and bed immediately. It is not necessary to wash the potatoes after they are treated.

Caution.—Bichloride of mercury is a *deadly poison* and should not be kept where children, animals or fowls will drink it. It has no bad effects on the clothing or on the hands.

Preparation of Seed-beds

All old soil should be removed from the hot-bed, and composts from old potatoes from last year's bed should be carted away and destroyed. Sterilize the wood-work of your hot-bed with formaldehyde (3 pints to 50 gallons of water) or with copper sulfate (2 pounds to 50 gallons of water). Select a clean sandy soil 6 or more inches below the top soil in woodland or on soils known not to have been cropped to sweet potatoes. It is sometimes advisable to sterilize the sandy soil with formaldehyde prepared as above and ap-

plied at the rate of 1 gallon to the square foot of bed. At least 6 inches of good sand should be used in the bed. Sterilize all new implements to be used in the preparation of the new bed by dipping in a 5 per cent solution of formaldehyde, especially if they were used in cleaning out old hot-beds.

Sweet potatoes should be given plenty of space in the bed. After they are properly placed in the bed, cover with a light layer of sand. Salt hay is used as a covering by most growers, who prefer it to canvas or sash.



Fig. 14. Preparing a Sanitary Hot-Bed for Sweet Potatoes, Clean Sand and Salt-Hay are Used

(Courtesy of Mr. L. A. Cooley).

It is very essential that the sweet-potato beds be well aired when the sprouts become numerous and large. At this period watering should be done in the mornings of clear warm days so that the tops will dry out before night. It is not a good policy to water plants on cloudy days. Soft rots frequently develop in the seed-beds as a result of improper management (fig. 9).

Moisture and temperature conditions should be controlled. Correct watering, heating and airing of sweet-potato hot-beds will reduce the rots to a minimum. The lowering or raising of these conditions toward either extreme will cause injury, which will generally be followed by rots.

It is not necessary to give in detail sweet-potato hot-bed construction and management from a cultural standpoint. This part of sweet-potato growing is well understood by the growers, and is

covered in Circular 114 of the New Jersey Agricultural Experiment Station, which can be had on application.

Sweet-potato growers are gradually doing away with beds which derive their heat from fresh manures. The hot-air and steam-heated beds are extensively used in New Jersey and have given very satisfactory results. Concrete walls and floors are fast replacing boarded beds. These latest developments in hot-bed construction in a large way are solving the disease problems in the hot-bed, especially when seed is selected in the fall and sanitary measures are taken up until the sprouts are planted. In place of sash or canvas coverings to protect their plants from severe tem-



Fig. 15. Dipping Selected Sweet-Potato Seed in a Bichloride of Mercury Solution; They are Immersed for 10 Minutes; Bushel Baskets are Easily Handled

(Courtesy of Mr. L. A. Cooley).

peratures, growers more recently have used salt hay which permits a good circulation of air over the bed at all times.

Growers who have built concrete beds have been very successful in developing sprouts, and they have thus insured their beds against fire, which sometimes causes heavy losses in wooden-frame beds. The construction of concrete-frame beds, and the use of salt hay, preferable to sash or canvas, clean sand taken 6 inches below the top-soil in woodland and any other sanitary methods which will decrease the development of sweet-potato diseases in the seed-bed, are to be highly recommended. When these methods come into general use diseases undoubtedly will be greatly reduced in the sweet-potato growing sections.

Field Preparation and Setting

Practice crop rotation as much as possible. Have the field prepared by the time the plants are ready; this is especially important if the plants are over-sized. Setting the sprouts in the field after rains is most likely to give the best results, but this is not always possible. Sprouts set when there is lack of sufficient water in the soil to support immediate growth are liable to be stunted,



Fig. 16. Soft Rot of Sprouts Due to Several Diseases when Temperature and Moisture Conditions are Excessive in Beds Poorly Aired

rendering them susceptible to diseases, especially stem wilt. Always set immediately after pulling the sprouts from the hot-bed. Never allow the young roots to dry out. Sometimes when plants are shipped from other states the loss is great because of injury caused by the roots drying out. The plants should be examined very carefully when taken from the hot-bed, and all those showing black rot, canker or other diseases should be thrown out. Never use plants from partly rotted potatoes.

Field Conditions

Sweet potatoes grown on soils containing a high percentage of organic matter are usually attacked by disease of some kind. Scurf is very severe on heavy soils, especially those containing large quantities of stable manure, or other organic manures. Soil rot has been most severe on soils where lime was liberally applied and on soils following alfalfa and clover sods which were only slightly acid. Black rot has been found to be very generally distributed in wet, rich soils. Stem wilt is most destructive on sandy soils, and on all soil types during dry seasons. Some of these diseases will, therefore be more prevalent during some seasons than at other times, when moisture and temperature conditions will not be favorable for their development.



Fig. 17. Soft Rot of Sprouts at the Left, and Healthy Sprouts at the Right

It is sometimes necessary to apply organic manures to sandy loam soils in order to keep them in a high state of productiveness. Growers should arrange their rotation so that manures can be applied from 8 to 12 months before the potatoes are planted. Even this will not always assure a clean crop. If diseases have been severe on potato soils containing much organic matter, commercial fertilizer should be applied without manures for several years. It has been shown that a very large yield of sweet potatoes can be produced by using commercial fertilizers without organic manures

(fig. 17). Some fertilizers will burn the roots of potato plants when they are applied in the row unless they are thoroughly mixed with the soil. When roots are injured by fertilizer the plants are very generally attacked by the black rot and stem wilt fungi. Give considerable attention to the cultivation of early and young plants. Quick growth in the field will in a great many cases produce strong physiological characteristics in the plants that will resist many diseases to which they would otherwise be susceptible.

Demand for Seed

There is a demand for reliable New Jersey seed potatoes and plants, and the market for stock of high quality will increase in proportion as we improve the quality of our seed, and decrease in proportion to our failures. The department of plant pathology of the Agricultural Experiment Station is conducting experiments for the improvement of both seed and market stock, and will appreciate the cooperation of all progressive growers.